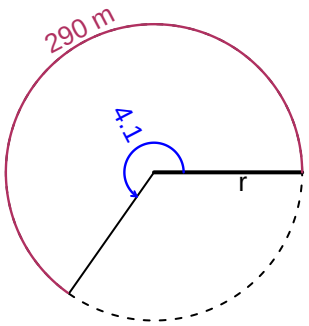
Name: Date:

Trig Final (SLTN v687)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.1 radians. The arc length is 290 meters. How long is the radius in meters?

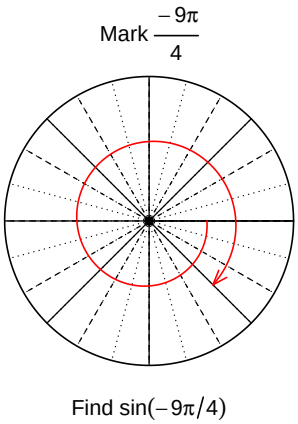


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

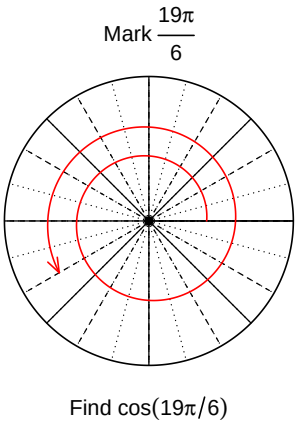
$r = 70.73$ meters.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{19\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(-9\pi/4)$



Find $\cos(19\pi/6)$

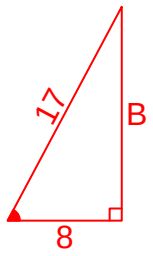
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(19\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-8}{17}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

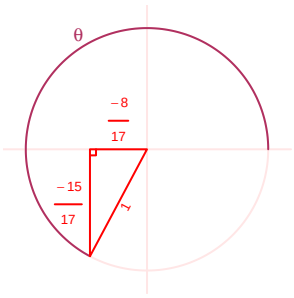
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$8^2 + B^2 = 17^2$$
$$B = \sqrt{17^2 - 8^2}$$
$$B = 15$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-15}{17}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 7.87 meters, a frequency of 6.03 Hz, and a midline at $y = 2.67$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.87\sin(2\pi 6.03t) + 2.67$$

or

$$y = 7.87\sin(12.06\pi t) + 2.67$$

or

$$y = 7.87\sin(37.89t) + 2.67$$